

Section 1: Top of Building

Flat Attics

There are both air sealing & insulation requirements in every flat attic space.

Air Sealing Requirements

All air bypasses into the attic shall be sealed air tight before completion of a weatherization project.

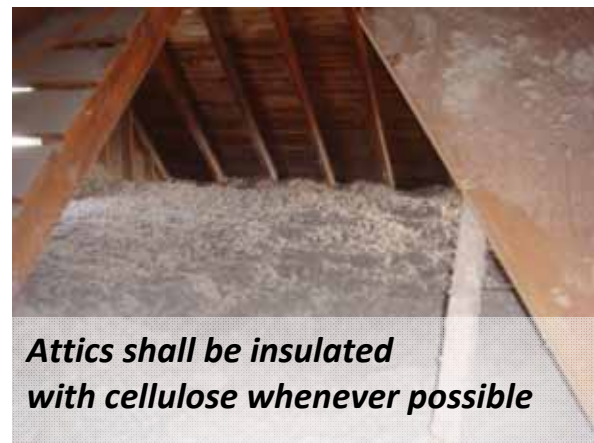
Attic air sealing must address all wire penetrations, plumbing vent stacks, attic hatches, surface mounted ceiling fixtures, recessed lighting fixtures, exhaust fan assemblies, chimney/flue chases, partition walls, merger walls between adjoining building sections, and all other miscellaneous bypasses.

All air sealing measures must be screened for cost effectiveness. Even if attic air sealing measures do not screen as cost effective for energy saving benefits alone, they still can—and must—be completed for air quality and building durability purposes. In the event an attic air sealing measure does not screen as an energy saving measure, it shall be considered a required indoor air quality measure and be completed during the weatherization project.

Insulation Requirements

All attic insulation measures must be screened for cost effectiveness prior to installation. Any insulation—*preexisting or added by WAP*—is to be assigned an appropriate “effective” insulation value based on the manner in which it is installed.

All “effective” R-values shall be determined with the aid of the BPI tables included as Appendix K in this manual.



Whenever any insulation is added by WAP the minimum effective R-value at project completion shall be R-49. If available roof clearance does not allow for an R-49, insulation must be added up to the roofline.



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Flat Attics *(continued)*

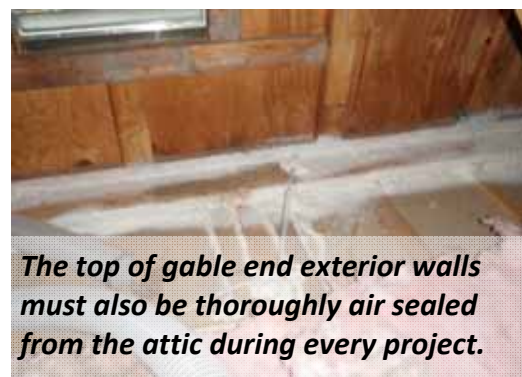
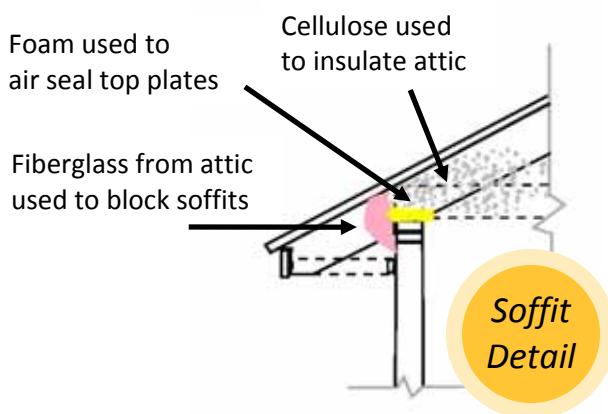
Perimeter Pull & Air Sealing/ Encapsulation Requirements

Any preexisting fiberglass batting shall be removed from the perimeter of the attic utilizing the **“Perimeter Pull Method”** before any additional blown-in insulation is added. Once the perimeter is cleared of fiberglass, **and all attic air sealing measures are complete and verified to be effective**, blown-in insulation must be installed around the attic perimeter and over the fiberglass batting throughout the rest of the attic.



This air sealing and encapsulation process is a lot of work, but it is essential to do before adding more insulation into an attic that already has fiberglass batting.

Remember, if there are air pockets between the ceiling and batt insulation, it will not matter how much cellulose you add over the top. Heat from the house will escape into and then out of the attic underneath the insulation. This type of heat loss is most problematic with strapped ceiling assemblies, but the perimeter pull is required on all weatherization projects with flat attic areas, even those without ceiling strapping.



At the eaves, foam must be applied to fully air seal the top plates during every project.

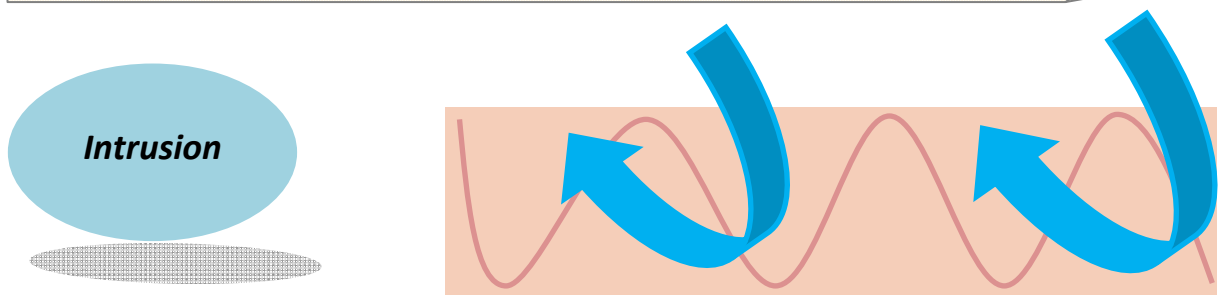
Whenever possible, it is recommended that fiberglass batting *(or an alternative blocker)* be used to aid the adherence of spray-applied foam materials to the outer edge of the top plate and to keep cellulose out of the soffit when insulating. (See the soffit detail above)

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Flat Attics *(continued)*

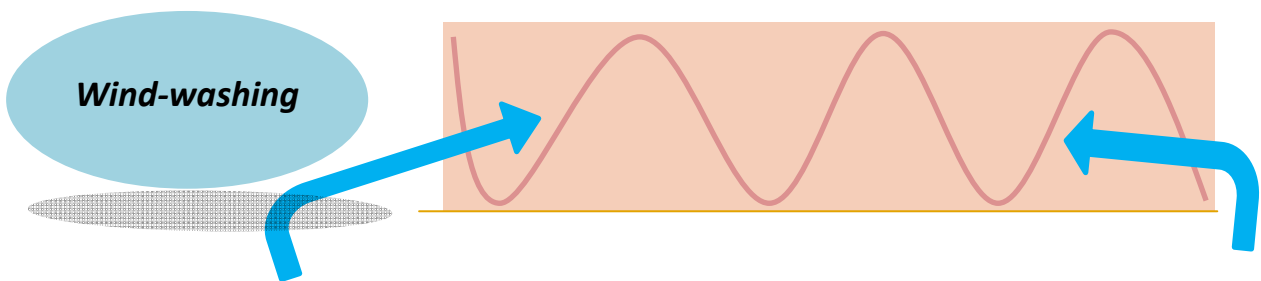
Intrusion & Wind-washing

According to the Department of Energy, intrusion and wind-washing can combine to reduce insulation effectiveness up to 50% .



Intrusion: Department of Energy Definition

Air moving into and out of insulation, without going through the wall or ceiling assembly. It will occur even when a good air barrier is present on one surface.



Wind-washing: Department of Energy Definition

Wind-washing is a phenomenon particular to fiberglass attic insulation. Air entering and leaving the attic through the attic vent openings is frequently able to blow through flat fiberglass attic insulation, removing heat as it goes.

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Flat Attics *(continued)*

Passive Ventilation Policy

The installation of passive vent baffles at the eaves of a flat attic is strongly discouraged. But this is an allowable action if all of the conditions outlined below are met.

1. Each baffle is installed in a manner that will protect the attic insulation from both intrusion and wind washing.
2. The perimeter top plates have been thoroughly accessed and air sealed with two-part, closed-cell foam.
3. The airsealing work at all bypasses between the living space and the attic has been verified as effective with blower door assisted smoke testing.
4. The perimeter pull method is utilized if there is preexisting fiberglass batt insulation.
5. An attic insulation measure screens as cost-effective (inclusive of the additional-ancillary-cost for the vent baffle installation).

Pre-existing Vent Baffles

If vent baffles are already present in a flat attic area it is allowable to leave them in place as long as conditions 1 - 4 outlined above are met at the conclusion of the weatherization project.



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Flat Attics *(continued)*

Attic Hatch (Standard Assembly)

Whenever roof clearance allows a hatch assembly must be installed *(unless continued access into the attic from a ceiling hatch is not desired by the client)*. A durable insulation dam shall be installed around all attic hatch openings. The dam must extend at least 2" higher than the settled insulation depth at the completion of the weatherization project.



Hatches built by Wx crews must have at least four inches of HI-R sealed to the interior surface of hatch assembly, w/all edges taped.

Attic hatch panels shall have a minimum effective R-value of 21.
Higher R- values are strongly encouraged whenever roof clearance allows.



**Q-lon
or
comparable**

If **manufactured panels** are being used as attic hatches, it is recommended that additional sheets of HI-R (*polyisocyanurate*) be added on top of the prebuilt panel with the edges sealed and taped.

Alternatively, additional inches of closed-cell spray foam can be applied to the top of the manufactured panel as shown above.

**Use of felt
weather-stripping
is not allowable.**

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Flat Attics *(continued)*

Attic Access (Walk up Staircase)

Whenever possible a hatch panel shall be located at the top of the staircase.



Less
Surface
Area



**Preferred
Thermal
Boundary**

**Better
Results**

Backup Plan:

Making the stairwell the thermal boundary

increases the number of surfaces that need to be addressed and reduces the ending R-values between the house and attic. When the stairwell area is addressed in this manner, it is often difficult to get an effective airseal that keeps warm air out of the attic. For these reasons, treating the walls of the stairwell, the stairs, and the door at the bottom of the staircase is strongly discouraged. If building a hatch assembly at the top of the stairwell is not possible, this weatherization practice is allowable.

If the weight of a large hatch assembly presents a concern, the hatch panel should be divided into sections or a pulley system should be installed. Both hatches pictured above meet the minimum R-21 requirement and provide a good tight airseal when closed.

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Flat Attics *(continued)*

Attic Access (Pull Down Stairs)

Unless the thermal boundary has been moved up to the roofline, a high quality attic hatch assembly shall be built and installed to enclose pull-down staircases.

The assembly is to include a durable insulation dam, a Q-lon (or comparable quality weatherstrip) and a removable top panel.

**R-21
Minimum**



Assembly Requirements:

- ✓ R-21 represents the minimum allowable insulation value for hatch assemblies.
- ✓ Higher R-values should be strived for whenever roof clearances allow.
- ✓ The sides of a hatch assembly/insulation dam shall be sealed air tight.
- ✓ Insulation must continue up the dam to the height of the Q-lon.
- ✓ If the Q-lon is above the settled depth of any blown-in insulation then the sides of the assembly shall be insulated separately with either HI-R (polyisocyanurate) or closed-cell spray foam.

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Sloped Ceilings (Closed Cavity)

All possible efforts shall be undertaken to ensure sloped ceilings are insulated to the highest performance value possible within the existing closed cavity.

The same policy applies to floored attics which are covered in Section 1: Page 11.

Tubing Up



Tubing Down

Every roofline, regardless of how many there are, must be evaluated & thoroughly airsealed.

Whenever cost-effective, a roof insulation upgrade must also be performed.

Complicated/Numerous Rooflines & Attics



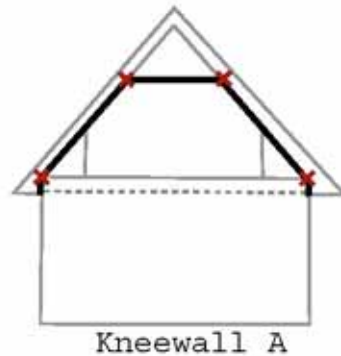
All air sealing measures must be screened for cost effectiveness. But, just like in a flat attic, even if roof air sealing measures do not screen as cost-effective for energy saving benefits alone, they still can—and must—be completed for air quality and building durability purposes. In the event a roof air sealing measure does not screen as an energy saving measure, it shall be considered a required indoor air quality measure and completed during the weatherization project.

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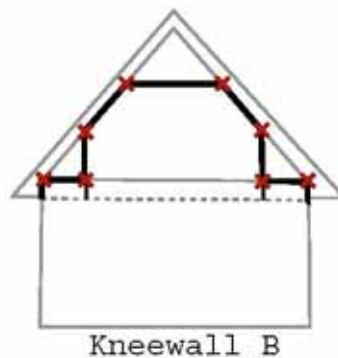
Kneewall Closets (Placing the thermal boundary)

The ***preferred thermal boundary*** shall be established at the slope as indicated here.

This method reduces the number *and difficulty* of the air sealing tasks required to properly establish a continuous thermal envelope. It also decreases the amount of surface area to be insulated.



When this method is used the floor system underneath the kneewall must be thoroughly air sealed. Tubing in and densepacking underneath the kneewall in each floor bay is not acceptable practice for this air sealing task. The area must be accessed and rigid insulation air sealed in place. Stuffing a fiberglass batt or alternative blocking material under the kneewall in each bay and spray foaming over the blocker is also acceptable for this task.



Plan A:

Treating the slope as the thermal boundary

To ensure a complete thermal envelope, the following surfaces shall be air sealed and insulated:

- Sloped roof section between the eaves and the top of the kneewall;
- Rimjoist area;
- Gable end walls; and
- When applicable, any exterior walls extending above the kneewall closet floor.

Plan B:

Treating the kneewall as the boundary is only allowable in two instances:

1. The kneewall framing provides a deeper cavity to insulate than the roof system framing does.
2. The kneewall closet is over unheated space (e.g. a bonus room above a garage or an exterior porch) and insulating the kneewall floor system will not be necessary.

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Kneewall Closets (Rim Joists/Beams)

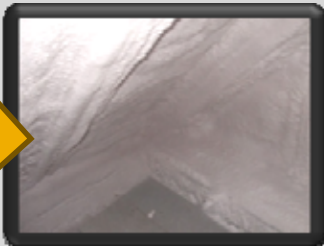
Whenever there is an accessible kneewall closet, the rim shall be addressed during a weatherization project.



**Rims
Matter**

With Spray-foamed slopes...

...With Dense-packed slopes



On the eaves sides it is encouraged to remove an outer floor board ,or cut out a swath of the outer subflooring, to expose the rim area and make it possible to airseal & insulate the rim with foam products. Alternately, it is acceptable practice to drill through the kneewall closet floor and densepack out to the rimjoist/beam on the eaves sides of a building with cellulose.

The rim & endwalls must always be thoroughly sealed and insulated inside each kneewall closet to ensure a complete thermal envelope.

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Decked Attic Floors

Thoroughly densepacking the decked attic floor cavities is the minimum requirement in a floored attic space. Installing additional insulation over the flooring is encouraged when cost-effective but is not required.

Airsealing

In some cases, a densepacked cellulose treatment alone can adequately air seal the house from the attic. But it is strongly encouraged that prior to densepacking, select floor boards get removed to access and foam-seal the tops of all partition walls and then those boards get reinstalled before the installation of densepacked cellulose.



Building Insulation Dams

It is allowable to divide an attic into sections or provide runways using insulation dams.

This is one way to maintain attic functionality and still be able to maximize insulation value over portions of an attic floor.



R-30 Systems



Alternate Approaches

If a client does not want cellulose blown over sections of a floored attic, consider alternative approaches.

Both insulation methods shown at left are allowable if practical and cost effective.

***Establish
Thermal Boundary...
Maintain
Storage Area...
Maximize
Insulation Value...***

During both Wx projects pictured above, 2-inch-thick HI-R (*polyisocyanurate*) provided another R-14 to the 5-inch cavities that were densepacked with cellulose during the projects.

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Top of Building Airsealing Protocols: Summary

Every “Top of Building” surface that is part of the pressure boundary—including attics, rooflines & exterior surfaces inside kneewall closets— must be evaluated and thoroughly airsealed.

Measure Screening Requirements

All airsealing measures must be screened for cost-effectiveness. But even if “Top of Building” airsealing measures do not screen as cost effective for energy saving benefits alone, they can—and must—be completed for indoor air quality and building durability purposes.

How to Proceed if this Type of Airsealing Measure Fails to Screen

In the event a “Top of Building” airsealing measure does not screen as an energy saving measure, it shall be considered a required indoor air quality measure and completed during the weatherization project.

Verification of Measure Effectiveness

All “Top of Building” airsealing measures shall be verified for effectiveness using smoke sticks/pencils in tandem with a blower door assembly prior to project closeout.

- ✓ Note that the use of alternative pressure diagnostics and/or infrared cameras to verify the successful completion of airsealing measures is also encouraged. However, these techniques must be utilized in addition to, not instead of, the required use of blower door assisted smoke testing.

Allocation of Airsealing Verification Costs

Smoke sticks and working hours utilized during the verification process shall be charged to individual projects as an ancillary cost using the appropriate measure coding, either *Airsealing* or *Indoor Air Quality*, depending on measure cost-effectiveness.

Clarifying note about mandatory airsealing tasks vs cost-effective airsealing measures

The only other area of a home where airsealing is required every time, regardless of cost-effectiveness, is at surfaces that separate a house from an attached or tuck under garage. All other airsealing tasks need to be cost-effective for them to be included in the weatherization scope of work.

